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# NORTH AMERICAN AIR DEFENSE COMMAND

## Weekly Intelligence Review (U)

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# NORAD

Weekly  
Intelligence  
Review

Issue No. 20/64, 15 May 1964

## The WIR in Brief

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to the appeal

### Space

TRANSMISSIONS FROM ZOND 1 STILL BEING  
RECEIVED, SAYS TASS

Third position report also given.

INTEREST IN LANDING MEN ON MOON SEEN  
IN NUMEROUS ARTICLES ABOUT MOON'S  
SURFACE

Articles appear in both lay and scientific press.  
THE SOVIET INTERPLANETARY EXPLORATION  
PROGRAM

A summary.

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as non-responsive  
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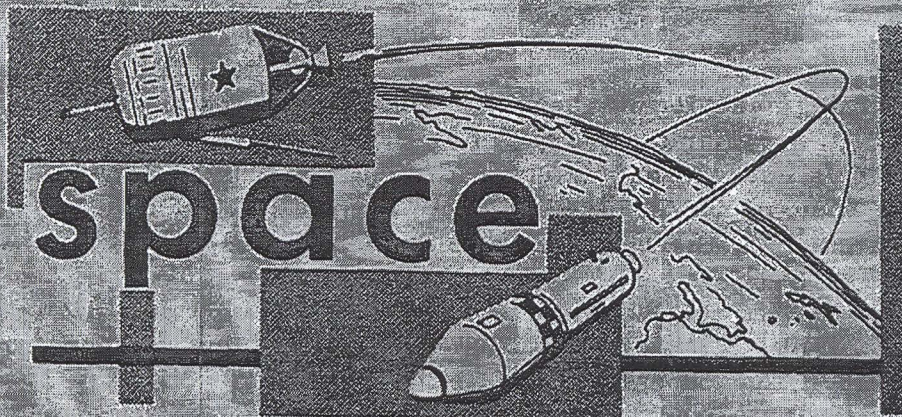
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significant  
intelligence  
on space  
developments  
and trends

### Transmissions from Zond 1 Still Being Received, Says TASS

The Soviet news agency TASS reported on 5 May that 60 radio communications sessions had been held with the Soviet space probe, Zond 1. This vehicle reportedly transmitted scientific information as well as data on the functioning of its own systems. On command from the Earth, the vehicle switched its power on and off, transmitted data, and regulated its astro-orientation system, TASS said.

As of 1800 hours, Moscow time, 5 May, Zond 1 was estimated by the Soviets to be 10,137,000 kilometers (about 5.4 million nautical miles) from the Earth and receding from it at a speed of 3.44 kilometers per second (1.85 n.m. per second). Its celestial coordinates at that time were, according to TASS:

Right ascension

3 hours, 14 minutes

Declination

Minus 4 degrees, 30 minutes

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(Begin ~~SECRET~~) Zond 1 is a space probe, according to the Soviets, but it is undoubtedly an attempted Venus probe -- the Soviets not acknowledging it as such, since they wish to avoid embarrassment if it fails, as have all other previous Soviet interplanetary attempts. It was launched from Tyuratam on 2 April 1964. The Russian word "Zond" means "probe" or "sunder."

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### Interest in Landing Men on Moon Seen in Numerous Articles About the Moon's Surface

Both lay newspapers and scientific journals in the USSR fairly often publish articles about the surface of the Moon which tend to support the belief that the Soviets intend to land men there eventually. Translations of two such articles have appeared in previous WIRs:

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- An article summarizing speculation about the probable texture of the lunar surface, that is, whether the Moon is covered by seas of dust or rocks, or whether it is encrusted, and if so, to what depth (WIR 37/63).
- An article about the type of space suit that would permit a cosmonaut to move about the surface of the Moon or the planets (WIR 19/64).

Other relatively recent Soviet press items on this subject include an article in the 24 January 1964 issue of Pravda and 2 articles in the November-December 1963 issue of the Soviet scientific journal, Cosmic Research.

The Pravda article described efforts to learn something about the Moon's surface with the help of radar echoes bounced off the Moon. This work reportedly is being carried on by the Gorkovsky Scientific Research Institute of Radio Physics.

The two articles in "Cosmic Research" were concerned with selenology -- the "geology" of the Moon.

The first article said that, until man can physically set foot on the Moon, the best way to get a better understanding of the Moon's physical history and development is to study it from a geographico-geological point of view. To this end, the author proposes that geologists and astronomers join together in a study of the Moon's mountains, craters, cirques, fissures, and "seas," using currently available maps and visual observation, and then prepare "selenological" maps showing the structural features of the Moon. In this connection, he urges that geologists sit at the eyepieces of optical telescopes in order that they may manually sketch in on existing Moon maps those geologically significant features which are too faint to be photographed but which the eye can see through the telescope. Such studies, he says, may lead to a better understanding of the earliest geological history of the Earth. He notes that the Moon, like the planets Earth and Mars, has a block structure. Much of the evidence for the Earth's block structure, however, is hidden by the oceans and erosion products -- features which do not exist on the Moon.

The second article in Cosmic Research presented a brief summary of the work done to date along the lines recommended in the first article. Both sides of the Moon were covered. The author points out what he believes to be the main structural elements -- an ancient massive, new massives, belts of depressions, fault lines -- and then tries to define the "selenological" eras -- Ancient, Ptolemaic, Copernican, and Modern -- in which they were formed. Four selenological maps accompanied this article, one of which is shown on page 35.

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## The Soviet Interplanetary Exploration Program

The Soviets have launched interplanetary probes toward Mars and Venus every time the launch "window" has been open, beginning with two attempts to launch probes toward Mars in October 1960. (The launch window is "open" when the Earth and the target planet are most favorably positioned with respect to each other, from the standpoints of propulsion, guidance, and communications, for attempting a launch. The window for Venus opens every 19 months for Mars every 25 months.) The Soviets have made 12 interplanetary probe attempts to date, 7 for Venus and 5 for Mars, with the following results:

<u>Launch Date</u>	<u>Target</u>	<u>Soviet Designation</u>	<u>Results</u>
10 Oct 1960	Mars	None	3d stage failure
14 Oct 1960	Mars	None	3d stage failure
4 Feb 1961	Venus	Sputnik 4	4th stage failure
12 Feb 1961	Venus	Venus probe	Communications failed 11 days after launch
25 Aug 1962	Venus	None	4th stage failure
1 Sep 1962	Venus	None	4th stage failure
12 Sep 1962	Venus	None	4th stage failure
24 Oct 1962	Mars	None	4th stage failure
1 Nov 1962	Mars	Mars 1	Communications failed about 5 months after launch; mid-course guidance would have failed, if applied, since vehicle was tumbling
4 Nov 1962	Mars	None	4th stage failure
27 Mar 1964	Venus	Cosmos 27	4th stage failure
2 Apr 1964	Venus	Zond 1	Propulsion and communications apparently successful to date; Soviets do not admit that Zond 1 is a Venus probe.

Launch Vehicle and Technique. All Soviet interplanetary attempts to date have involved use of the parking-orbit technique with the SP-1 vehicle. All launches have been made from Tyuratam.

The SP-1 (an FTD designation) consists of the SS-6 ICBM for the first and second stages (booster and sustainer), a heavy third stage (referred to within the intelligence community as the Venik), and a fourth stage. The third stage injects the fourth stage and payload into a parking orbit around the Earth. The fourth stage is used to inject the payload from parking





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orbit into a transfer trajectory toward the target. All four stages use liquid propellants. The payload of Mars 1 also included a midcourse guidance propulsion package.

Guidance requirements at the point of injection into interplanetary trajectory are stringent when using the parking-orbit technique. The Soviets probably preplan a transfer trajectory, based on a preplanned parking orbit; deviations of the actual parking orbit from the one planned are learned accurately from beacon tracking. FTD estimates that corrections to the transfer trajectory are then computed and transmitted to the fourth stage before it injects the payload into transfer trajectory.

There is a tendency for the Soviets' attempts to occur toward the end of the launch window, when propulsion requirements are a little heavier but when injection-guidance accuracy, interplanetary flight time, and the communications distance involved are near minimum.

Payloads. No hard intelligence is available on the payloads used by the Soviets to date, but the many reports published by the Soviets are consistent with US state-of-the-art and accepted design criteria. The Soviets' payloads appear to have been much heavier than those of the US interplanetary probes and to have carried much more instrumentation. This is consistent with the greater propulsion capabilities of the Soviet launch vehicle. The 1961 Venus probe payload reportedly weighed 1415 pounds; Mars 1 1965 pounds.

Mars 1, for example, had two separate compartments containing instrumentation, one for collecting data on interplanetary space while en route to Mars, the other for collecting data while in the vicinity of Mars, according to the Soviets. Instrumentation included:

- A photo-TV device for photographing the surface of Mars.
- A spectro-reflectometer for detecting organic ground cover on the planet's surface.
- A spectrograph for studying the ozone absorption bands in the Martian atmosphere.
- Magnetometers for detecting the magnetic field of Mars and for measuring magnetic fields in outer space.
- Gas-discharge and scintillation counters for detecting the radiation belts of Mars and for study of the cosmic-radiation spectrum.
- Counters for sampling the atomic (nuclear) components of primary cosmic radiation.
- A radiotelescope for study of cosmic radiation in the 150- and 1500-meter portion of the spectrum.
- Special sensors (traps) for registering streams of low-energy protons and electrons and also the concentration of positive ions near Mars and in space.



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- Sensors for registering collisions with micrometeorites.

The instrumentation carried by Zond 1 has not been announced by the Soviets, beyond the statement that it carries instrumentation for collecting data on interplanetary space. It undoubtedly also carries instrumentation for registering data as the vehicle passes near or impacts on Venus, but the Soviets are not likely to admit that it carries this type of instrumentation unless and until the Soviets actually receive data about Venus from this vehicle. To date they have not even admitted that this vehicle is a Venus probe, although all the evidence points to it.

Purpose. The instrumentation carried by the Soviet interplanetary probes indicates that their mission is to collect scientific data about the characteristics of interplanetary space and the planets. However, much valuable technical information will be collected on space communications, inflight power supplies, guidance, and space-restartable engines, which are of importance to military space weapons systems.

The Future. Larger payloads for forthcoming Soviet interplanetary probes are expected in the relatively near future, but not with the SP-1, which has reached its engineering limits.

Larger payloads can be devoted to heavy instrumentation, to more sophisticated guidance and control systems, or to a combination of both. Improved guidance and control systems will be needed for making soft landings of instrumented packages on the planets. The Soviets may plan to do this in the 1970s -- possibly aiming for Mars in 1971.

There is little prospect for manned Soviet interplanetary flights before 1980, in view of the numerous problems that have to be solved first. More knowledge of interplanetary space, solar radiation, and the characteristics of the planets themselves is needed, and solutions will have to be found for problems relating to closed ecological systems, electrical and/or nuclear propulsion, and the use of multiple-manned spacecraft.

For the more immediate future, it can be expected that the Soviets will make a major effort to launch instrumented probes toward Mars when the window opens later this year (approximately 1 November to late December 1964.)

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## Soviet Interplanetary Probes -- Systems Characteristics

Mission	Scientific exploration and development of space sub-systems.
Trajectory	Earth parking orbit, then transfer to free-flight interplanetary trajectory; mid-course correction for later vehicles.
Limitations	Launch window open at 19-month intervals for Venus, 25-month intervals for Mars.
Payload	1415 pounds for the 1961 Venus probe and 1965 pounds for Mars 1 (1962), according to Soviet announcements. (Photos on page 38.)
Launch Point	Tyuratam Missile Test Range.
Launch Vehicle	SS-6 ICBM booster/sustainer, Venik (heavy) third stage, and interplanetary injection fourth stage.
Command	Combination of preprogramed and ground command.
Control	Thrust-modulated programed guidance with inertial components and radio assistance in yaw.
Instrumentation	

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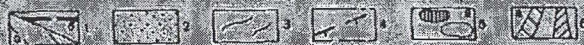
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This is a detailed map of the Eastern Hemisphere, showing the Indian Ocean, the Pacific Ocean, and the Atlantic Ocean. The map is labeled with various geographical features, including the 'Море Южное' (South Sea), 'Море Северное' (North Sea), 'Море Восточное' (East Sea), and 'Море Западное' (West Sea). It also shows the 'Море Неизвестное' (Unknown Sea) and 'Море Тихое' (Pacific Sea). The map is divided into several regions, each with its own set of labels. The map is oriented with North at the top.

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1а — кристаллы массива, б — границы массивов, 2 — впадины (жюры), 3 — простирание горных сооружений и поднятий, 4 — глубинные разломы (дислокации), 5 — направление опускания блоков, 6 — главнейшие цирры и кратеры, а — молодые, б — горные соору-  
жения и поднятия, а — молодые, б — горные соору-

- 1a. Ancient massive. 1b. Borders of the massive. 2. Depressions ("seas").  
3. "Strike" of mountain folds and elevations. 4. Deep faults (showing the direc-  
tion of drop of blocks). 5. Main cirques and craters. 5a. Young cirques and craters.  
6. Mountain folds and elevations. 6a. Young mountain folds and elevations.



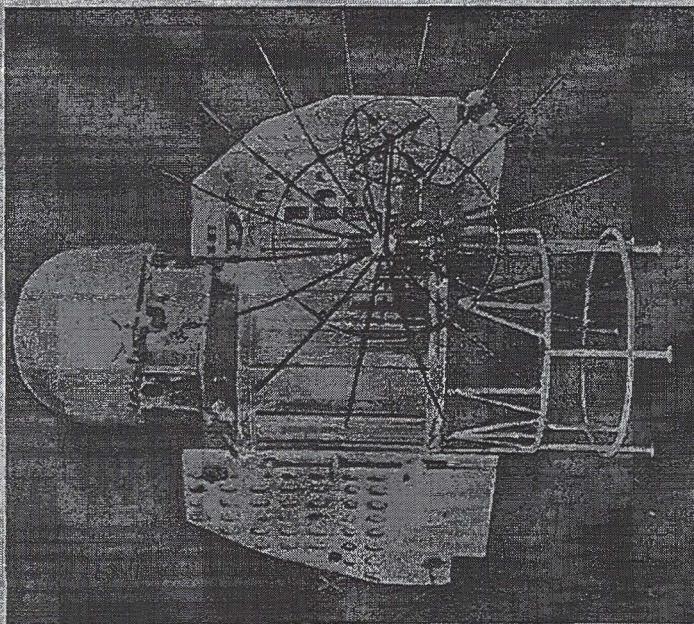
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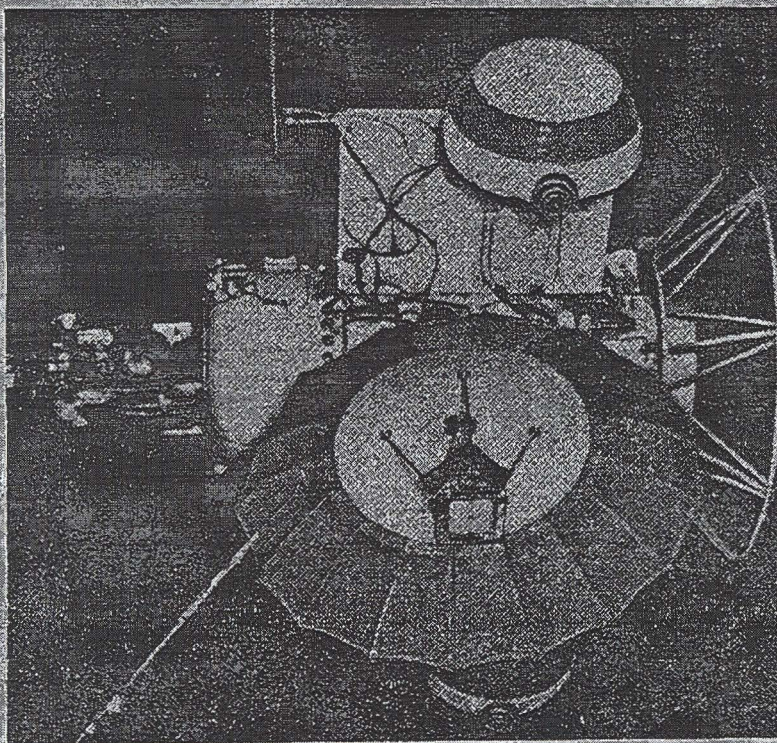
Venus Probe



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Mars 1



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